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Physics Motion Applied to a Ball Using OpenGL

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Abstract

In this paper, we show motion of ball with the help of computer graphics using OpenGL API.. The purpose is to adequately show a continuous and meaningful motion sequence of ball when a user interacts with 3D through camera. Here we create an object with vertex shader and fragment shader through OpenGL. By adding physics library to the ball it performs physical motion like falling down towards the ground with the help of gravity. The object gets collide with the ground and move on the ground, when force is applied it comes to resting state. The primitive graphical shape like sphere for ball can be created with OpenGL and color can be applied to through fragment shader.

Keywords: OpenGL, fragment shader, Vertex shader.

Introduction

Creation of ball is done with geometry primitives. It can also be done with vertex shader for the wired diagram of ball. To have a real look fragment shader is used for color and maintain it solid sphere. To have a physical motion we need to create a dynamic world to the graphics world .In dynamic world we can perform the all physical mechanism work to the ball .We can create a ground and add gravitational force to it .and creation of rigid body motion and collision of object. Every translation of frame work of ball and initial position of ball creation can be handled by transformation. To handle all task of physical work, we need to add physics library. It consists with dynamic mechanism, collision work, centre of mass and kinematics. To have a real effect in 3D we use camera which can be handled by OpenGL library API. We can also handle the ball with mouse clicks and drag the ball in to collision world.

Related Work

In this section, related methods of rendering and physical simulation are described. OpenGL is premier environment for developing portable, interactive 2D and 3D is graphic application. Since its introduction in 1992, OpenGL has become the industry's most wide used and supported 2D and 3D graphic application programming interface (API), bringing thousands of application to wide a variety of computer platforms. OpenGL fosters innovation and speeds application development by incorporating a broad set of rendering, texture mapping special effects and other powerful visualization function. Developers can leverage the power of OpenGL across all popular desktop and workstation platform ensuring wide application deployment.

Methodology

The proposed methodology is useful for gaming technology and motion sensing technology. Supporting and required libraries for this methodology are GL, GLUT, GLEW, Mesa libraries. Let us see mechanism of work, First creation of dynamic world, then creation a ground for collision object with mass assigned as zero. If mass is zero it is in static stage (non-movable), otherwise dynamic stage (movable). Since, the ball is in active state, so that if we give random value gravitational force will effect on the ball. When ball get collided with the ground it bounces back due to repulsive force from ground and gravity. Then finally it comes to passive state on to the ground. We can also create a multiple balls from single ball at initial position in the dynamics world. For the generation of multiple balls from single ball a key is assigned, so that if we press it will generate multiple balls. The ball can be moved and rotated with mouse. When we handle the ball with mouse it comes in to active state. When we release the object it comes back to resting state after colliding with the ground It is platform independent and robust to hardware changes.

Results and Discussion

In this section, we experiment on the proposed method for showing the implementation result interact with ball. We Demonstrate 3D model of a ball

Fig 1: 3D model of a ball with skeleton structure

Fig 2: 3D model of a ball with skeleton structure with wireframe

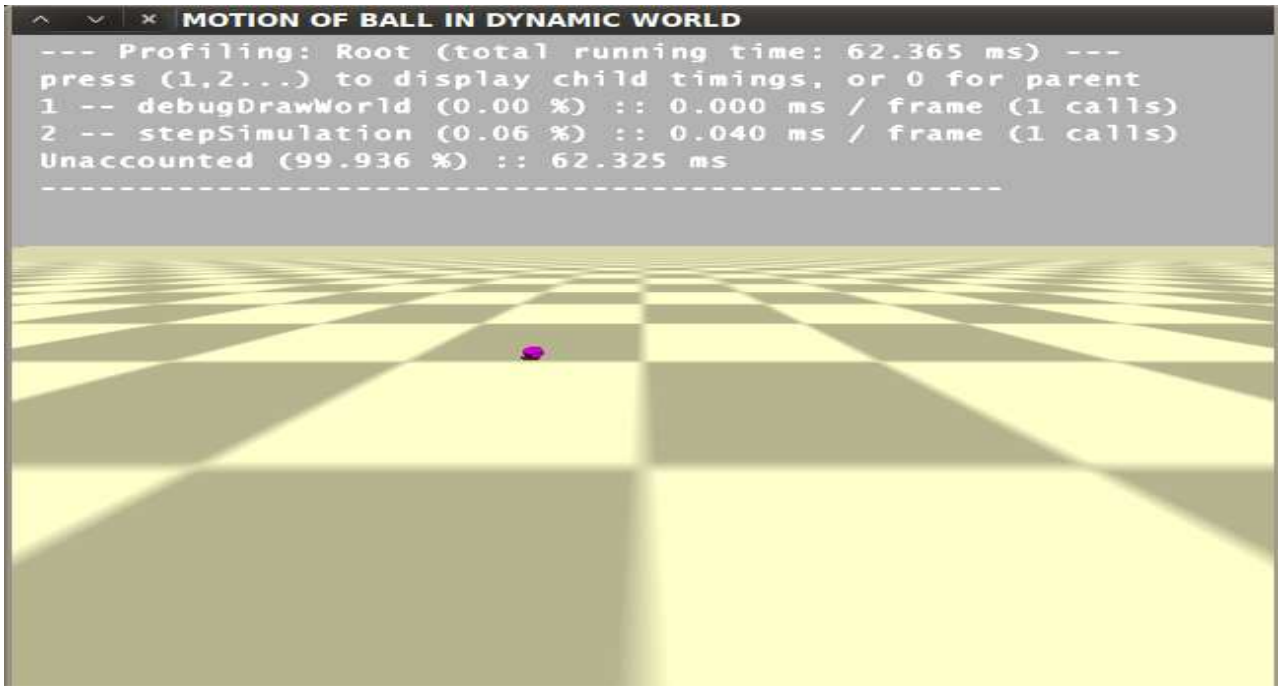

Fig 3: Passive state of ball on ground

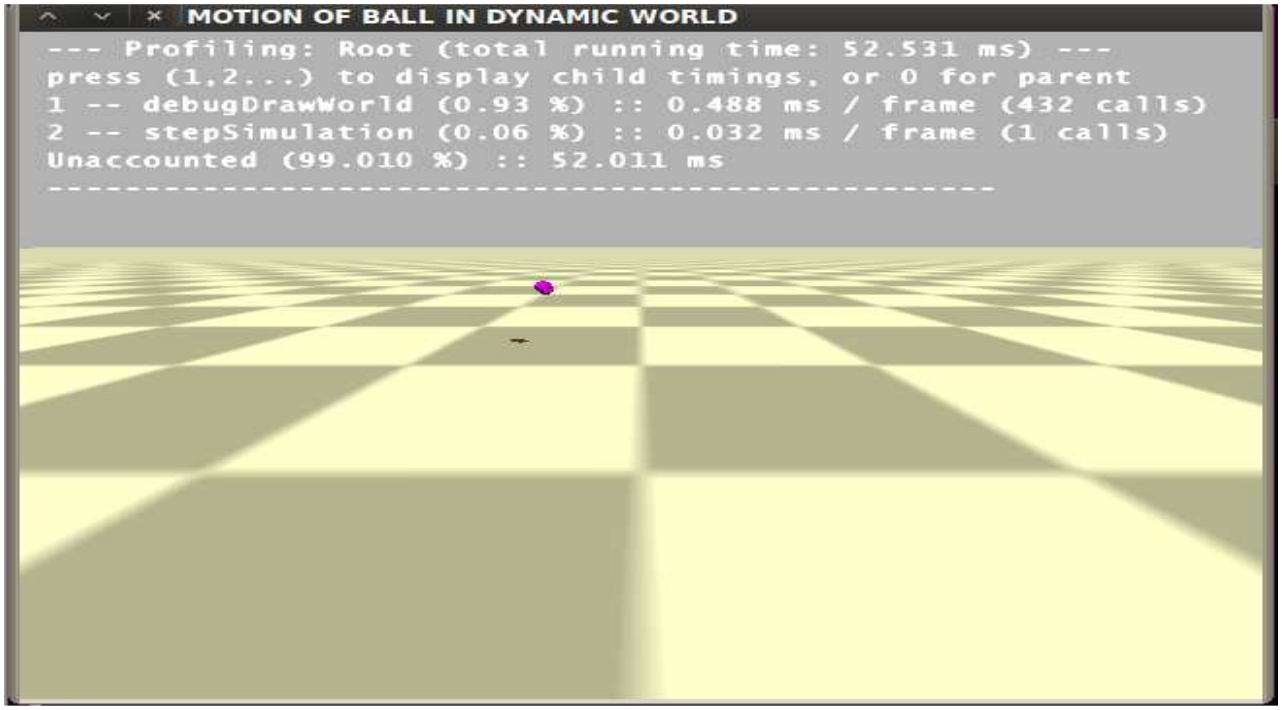

Fig 4: Active state of ball from passive state

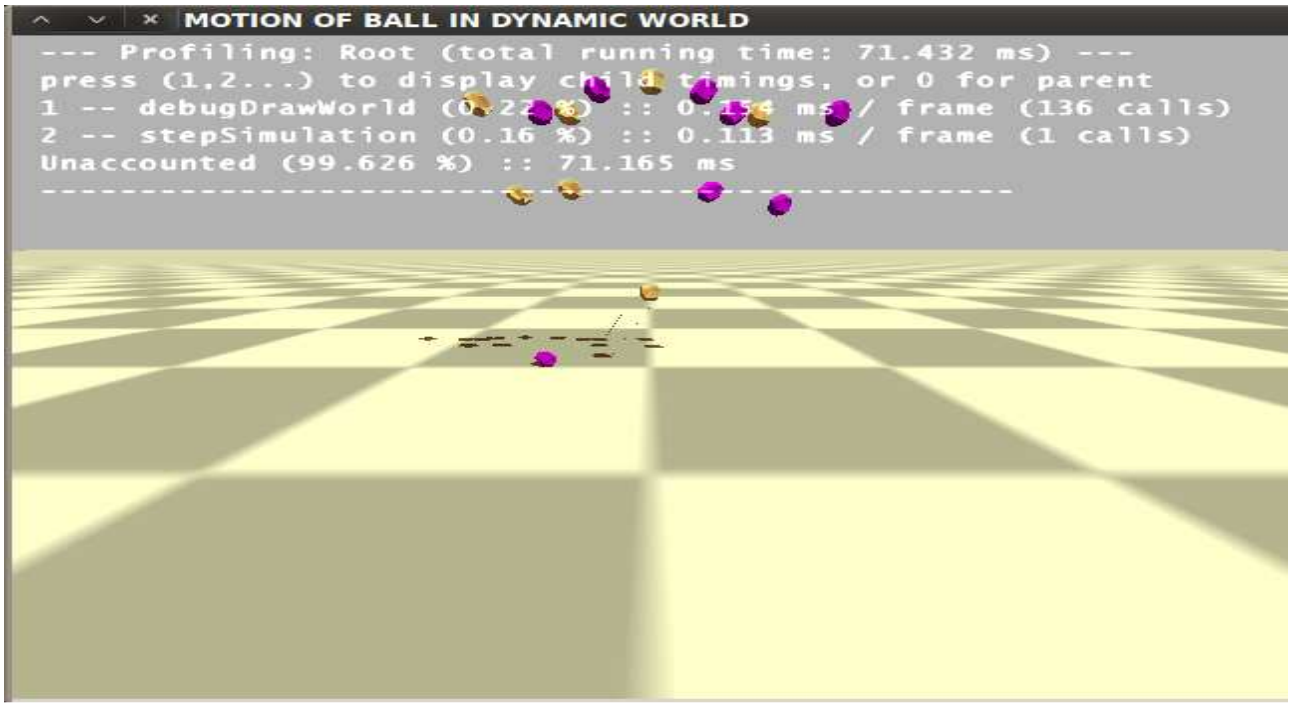

Fig 5: Duplication of Single ball to multiple balls

Conclusion

In this paper, we have successfully created a ball with physical motion. In future we can also perform these with different geometry primitive polygon and joining the polygon part can be done with constraints and also applied degree of freedom (6dof).It can be useful for gaming technology and motion sensing technology.

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